With the Authors compts

ON
CERTAIN CIRCUMSTANCES
AFFECTING THE
COLOUR OF BLOOD DURING COAGULATION.

BY

PATRICK S. K. NEWBIGGING, M.D., F.R.C.S.E.
FORMERLY SENIOR PRESIDENT OF THE ROYAL MEDICAL SOCIETY, ONE OF
THE MEDICAL OFFICERS OF THE NEW TOWN DISPENSARY, &c.

From the Edinburgh New Philosophical Journal for October 1839.

COLOUR OF BLOOD, &c.*

During the summer of 1834, whilst engaged in prosecuting some inquiries into the state of the blood in eruptive diseases, my attention was called to the appearance of various vermilion-coloured spots, represented upon that portion of the coagulum which had been in contact with the lowest part of the cup, in which the blood drawn from a patient had been received. On examining the interior of the cup, I found that the outline of that portion of the ornament which was of a green colour, corresponded exactly with the figure of the vermilion-coloured spots on the clot; upon the rest of which, where in contact with any of the other colours with which the interior of the cup was decorated, no change was observable. The circumstance appearing curious, and not as yet, as far as I knew, noticed, I stated the fact in a short communication to the Royal Medical Society. Thereafter I was induced to repeat the experiment with the same cups in several instances in which I had occasion to draw blood, and always with a similar result; the green invariably striking a bright red, contrasting strongly with the dark hue of the surrounding coagulum. With the view of satisfying myself that the appearances were altogether unconnected with any diseased condition of the blood, I procured an individual in perfect health, from whom I let blood in the ordinary way. In this, as in other instances, the green produced precisely the same vermilion figures. Finding this to be the case, I determined to ascertain, as far as I had an opportunity of doing so, whether, and to what extent, any other colours produced a similar effect; for as yet I had seen no change from contact with any colour excepting green. My interest was still further increased, by understanding from Dr Abercrombie that he had made a similar remark. With this view I procured a variety of cups, with devices of various colours decorating their interior; and these I used in many cases in which I had occasion to draw blood, but without succeeding in obtaining any change of colour upon the coagulum, except from the green. This was invariable, provided the colour was decided and brilliant; the impression on the clot being always an accurate representation of the ornament on the cup. The result of these observations I communicated in a short notice I read to the British Association at their meeting in Dublin in August 1835.

---

* Read before the Royal Society of Edinburgh, March 1839, by Professor Forbes, who, along with Sir John Robison, witnessed several of the experiments.

Owing to an absence abroad, it was not till lately that I had an opportunity of resuming my inquiries into the subject. During the last two or three months, however, I have made a considerable number of experiments, under various circumstances, with the view of ascertaining some of the conditions which affect the result.

I procured a considerable number of cups, with devices of different descriptions both as regards figure and colour, and subjected them to the usual method of making such observations, as often as a suitable case presented itself. In order also to trace if possible any connection, if such existed, betwixt the substances of which the ornament was composed, and the appearance on the blood, I obtained, through the obliging introduction of Mr Child of this city, a communication from Mr Ridgway of Staffordshire, giving much practical information as to the different ingredients which are used in ornamenting china. From him I learnt, that the bright green colour is composed of the green oxide of chrome, and laid on as a pigment in the usual way. Whilst another and very common method of ornamenting china was, by laying upon the biscuit previous to its being glazed, a device printed and coloured upon paper. By this mode there is no perceptible elevation of the ornament, and the colours are not so deep or brilliant.

In the progress of numerous investigations, I found that there was invariably an accurate representation of the ornament, provided the colour was of bright green, and slightly elevated as it is when affixed to the china by the former operation, but could observe no effect whatever in those cases where the decorations appeared to have been produced by the latter process. With the view of further illustrating the subject, I caused the seven prismatic colours to be painted on separate lozenges at the bottom of a cup, and had them coated with copal varnish. Out of four experiments which I made with this cup, I procured no change excepting in one instance, and that was merely a light mottling, barely appreciable, but in no respect corresponding with the effect produced by the green ornament in my former experiment. Up to this period, there appeared to me to exist two conditions, either of which might effect the result, namely, the brightness of the green ornament, and its partial elevation on the surface of the china; —the first being apparently connected with some chemical cause; and the latter possibly with the pressure upon the clot, or the order of distribution of the globules of which it is composed, as affected by the elevation of the ornament.

Oxygen being the recognised agent, producing the change from the dark purple of the venous, to the bright vermilion tint of the arterial blood, in the absence of any other probable explanation, it suggested itself to my mind that, possibly, there might be some peculiar affinity betwixt the bright green and that element of the atmospheric air, causing some of it to linger on the surface of the ornament, when the rest of the air had been expelled from the cup by the entrance of the blood. I resolved therefore to try whether another substance, similarly affected by oxygen, would produce any thing like a similar result. For this purpose I made a solution of isinglass with protoxide of iron, the effect of oxygen on which is to convert its leaden colour into that of a reddish brick, and poured it liquid into a cup, with a bright green device, that had, in every instance in which it had been employed, struck the corresponding vermilion image on the blood. On inverting the coagulum which was thus formed, after the upper surface, exposed to the air, had assumed the red colour, it was found that the rest of it, in contact with the interior of the cup, presented the leaden colour, without any trace whatever of change of tint on the part corresponding with the green ornaments. Unsuccessful in this, in order to assist me to estimate how far the other condition which I had observed, namely, the partial elevation of the green ornament, was connected with the result, I had artificial elevations made in the interior of the cup, by fixing a small piece of wood of the size of a button mould in the bottom of it, covered with copal varnish. During repeated experiments, the only effect from this was a depression corresponding to the elevation, but no perceptible change of colour. Still further to test how the effect might be produced by the impression of the elevation on a coloured surface, I substituted isinglass coloured with cochineal, which, when coagulated, and inverted, somewhat resembles the clot of blood. In this instance there was a depression corresponding to the elevation of the green ornament, but no change of tint.

Satisfied that the appearance could not be accounted for by any mere mechanical effect produced by the impression of the elevation, it occurred to me that possibly the blood in coagulating might so arrange its particles in relation to the ornament, as to produce the phenomenon described. With a view to test this, I drew blood into a plain white cup, and, after complete coagulation, removed the clot into one whose decoration had on many occasions given the vermilion colour. After allowing it to remain here for some hours, I again inverted it in the usual way, and procured a most accurate and beautiful representation of the ornament as in my first observations. This of course entirely contradicted this hypothesis.

Thus far in my observations I had remarked nothing to disturb my conviction of the appearance being connected with the colour of green. In no instance, and I had made upwards of sixty observations since I first noticed the circumstance, had I been able to observe the slightest difference of tint, when the ornament was of another colour. Upon a recent occasion, however, when employing a small cup with the device of a flower, of a pinkish or crimson colour, darker towards the circumference of the petals, and shaded off towards the centre, I was much surprised, on inverting the clot, to find a most perfect representation of the flower upon its surface, not only giving its outline with the utmost accuracy, but the different shades of the bright red corresponding in intensity with the darker and lighter parts of the ornament, so as to present to the eye a very fair image of the flower itself. On examining the cup minutely, it appeared to me that the colours had been laid on by the brush, and the margin of the petals of the flower being darker than towards their interior, was proportionally elevated. Subsequent experiments with the same cup produced the same result. This is the only instance, however, in which I have observed an effect from any other colour than green; and, during the course of my observations, I have employed cups with almost every variety of ornament, both as regards device and colour.

It is unnecessary to add, that this single observation at once put an end to any conjectures which I might have formed as to the green colour being indispensably connected with the effect. Whilst, on the other hand, it has left me still more in the dark than ever, as to the cause of the appearance I have ventured to describe. Nevertheless, I have thought it right to detail, in the way I have done, the different steps I have pursued in my inquiries, unsuccessful though these have been, in the hope that my doing so may aid in suggesting to others, some explanation of the phenomenon which I have been unable to give, as well as facilitate the inquiries of those who may be disposed to prosecute the investigation farther. The subject is one which has interested me not a little; and I shall certainly not lose sight of any opportunity which may offer of procuring additional information that may tend to throw any light upon it.